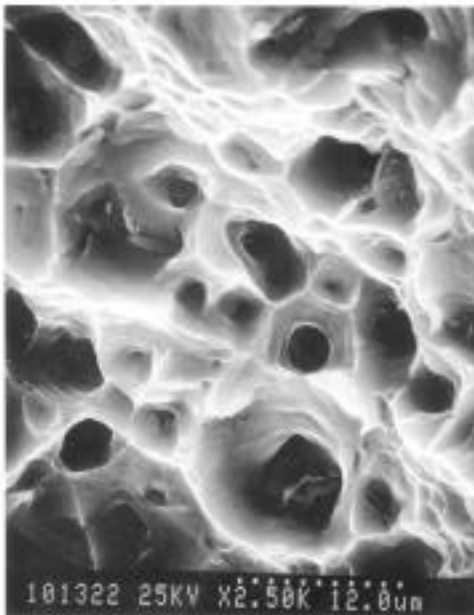
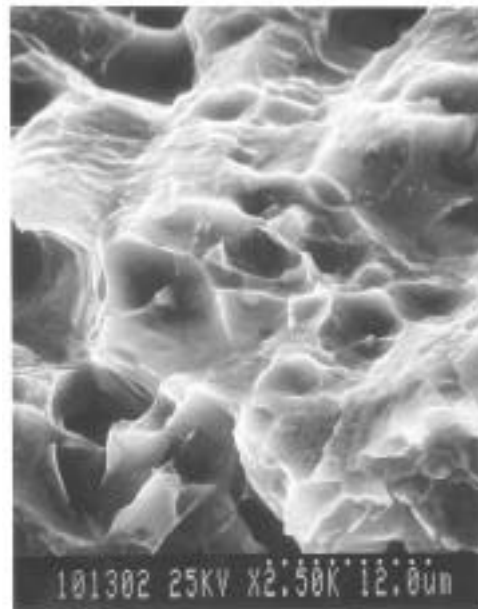


Quantitative Measurement of Material Damage

The Naval Research Laboratory (NRL), the Navy's corporate laboratory, has a program developing methods to determine the portion of the energy associated with mechanical loading that leads to material damage and the effects of complex loading histories and specimen geometry on damage evolution. Efforts focus on determining the portion of energy in fatigue loading that goes into material damage from the measurement of mechanical energy input to a specimen and the calculation of dissipated heat and the rise in internal thermal energy from temperature measurements. Tests have been conducted to determine the effects of loading history on mechanical behavior with combinations of cyclic and monotonic loadings. Mechanical data is integrated with computational simulations and with metallographic and fractographic observations of damage morphology. Changes in quantities such as microvoid density, size and shape are attributable to changes in loading history.



(a)



(b)

Fracture Surfaces of 6061 Aluminum Specimens Subjected to (a) 0 and (b) 6000 precycles

Quantitative Measurement of Material Damage

Military Impact

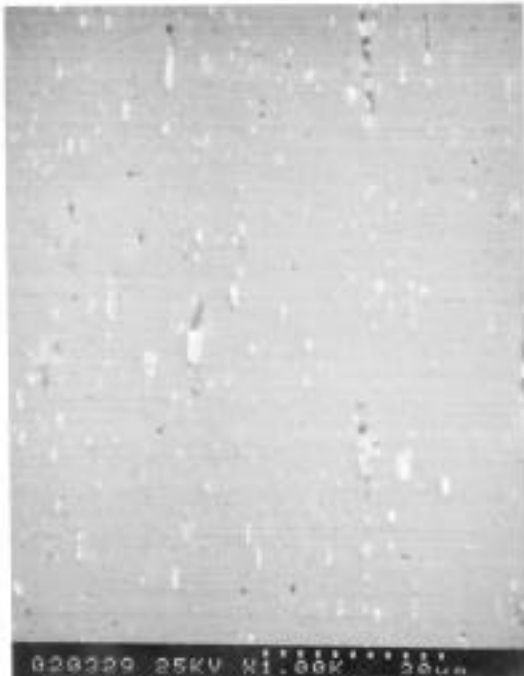
- Improved Predictive Capability for:
 - In-service Structure Response Simulation
 - Damage Tolerance (Survivability)
 - Condition-based Maintenance Schedules

Potential Civilian Spin-offs

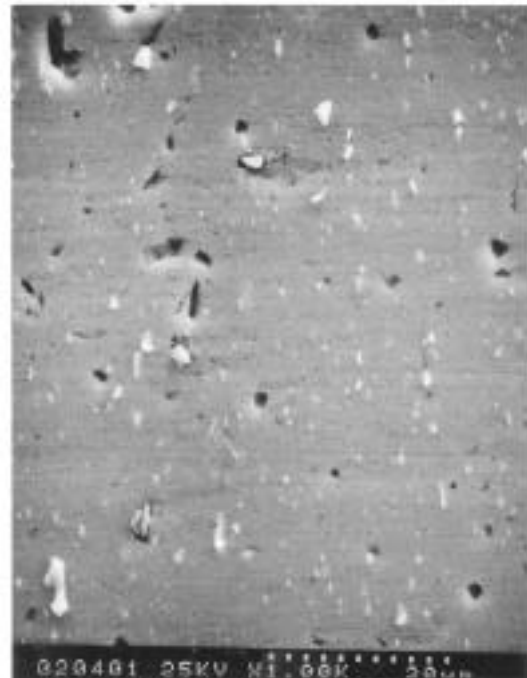
- Advanced modelling for:
 - Aerospace Structures
 - Automotive Structures
 - Transportation Infra-structure

Point of Contact

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Washington D.C. 20375-5343



(a)



(b)

Cross-sections of Commercial Purity Aluminum Specimens Subjected to (a) 0 and (b) 18000 precycles